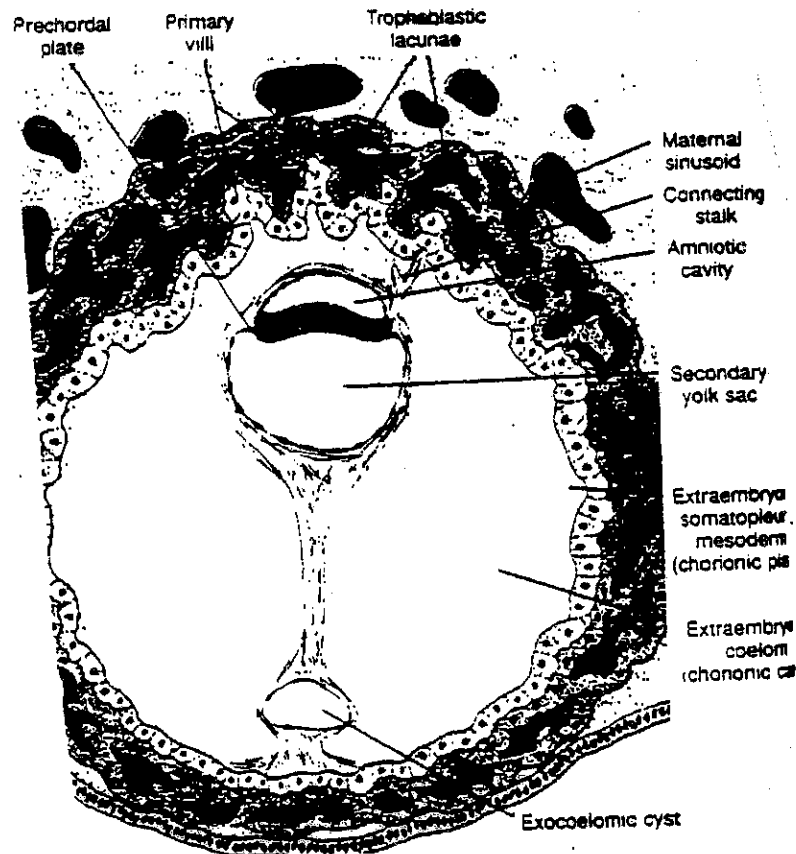


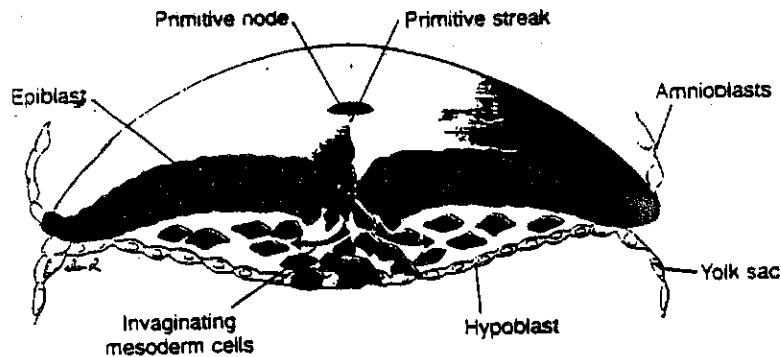
- a. It secretes proteins that Block Antibodies produced by the mother
- b. It promotes production of T Lymphocytes that suppress the normal immune response in the uterus
- c. It produces HCG
3. The inner layer eventually fuses with the Amnion
4. By the end of the second week, the bilaminar embryonic disc becomes connected to the Trophoblast by a band of extraembryonic tissue called the Connecting Stalk (future Umbilical Cord)



II. THE THIRD WEEK

- A. This begins a 6 week period of very rapid embryonic development and DIFFERENTIATION
- B. The three Germ Layers are established and lay the groundwork for ORGAN development
- C. Gastrulation
1. Begins at about 15 days after fertilization
 2. The two dimensional disc with epiblast and hypoblast becomes a two dimensional TRILAMINAR (3 layer) disc with three primary germ layers from which various tissue and organs develop
 3. It involves the REARRANGEMENT and MIGRATION of cells from the epiblast

4. The first evidence is the development of the PRIMITIVE STREAK, a faint GROOVE on the dorsal surface of the epiblast that elongates from posterior to anterior
5. This clearly establishes the HEAD and TAIL ends and RIGHT and LEFT
6. At the head end of the primitive streak is a small group of cells that forms a rounded structure, the PRIMITIVE NODE



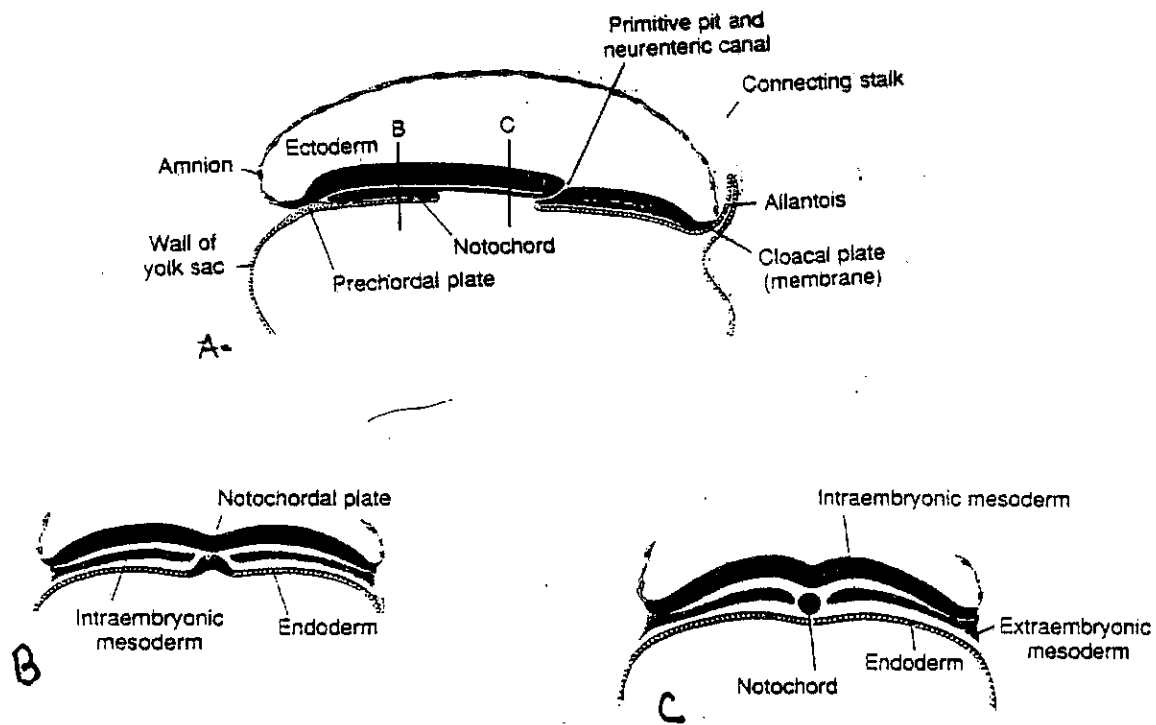
7. Following the formation of the primitive streak, cells of the epiblast move INWARD and BELOW the primitive streak as they detach (INVAGINATION)
8. Once the cells have invaginated, some displace the hypoblast, forming ENDODERM
9. The cells remaining between the epiblast and new endoderm form MESODERM
10. The remaining cells of the epiblast form ECTODERM
11. The ectoderm and endoderm are tightly PACKED but the mesoderm is loosely organized CONNECTIVE tissue
12. The endoderm becomes the epithelial lining of the GASTROINTESTINAL tract, RESPIRATORY tract and several other organs
13. Mesoderm becomes MUSCLE, BONE, other connective tissue and PERITONEUM, as well as the DERMIS of the skin
14. Ectoderm becomes EPIDERMIS of the skin and the NERVOUS system

D. At 16 days

1. The mesoderm cells from the primitive node migrate toward the HEAD and form a hollow tube in the midline called the NOTOCHORD process
2. At 22-24 days this becomes a SOLID cylinder, the NOTOCHORD
3. This plays an important role in INDUCTION, one tissue STIMULATING (inducing) the development of an adjacent unspecialized (RESPONDING) tissue into a specialized one
4. Inducing tissues produce a CHEMICAL that influences the responding tissue
5. The notochord induces certain mesodermal cells to develop into VERTEBRAL bodies

E. During the third week, two faint DEPRESSIONS appear in the dorsal surface

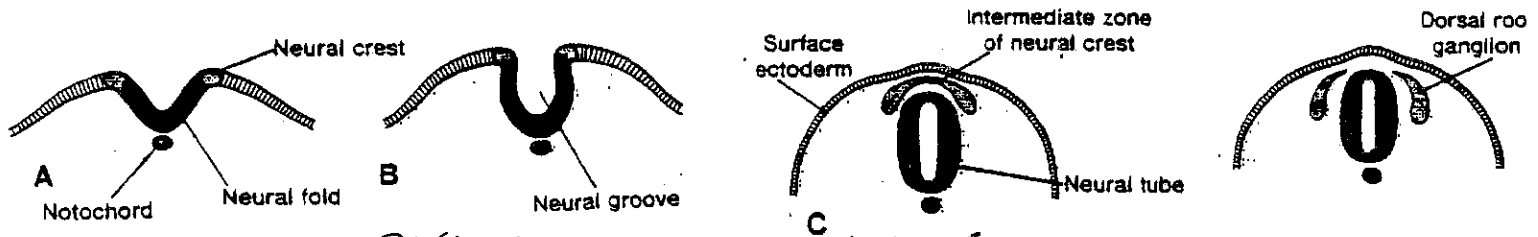
1. At the head end is the OROPHARYNGEAL membrane that breaks down in the 4th week to connect the MOUTH cavity and PHARYNX to the rest of the digestive tract



2. At the tail end, it is called the CLOACAL membrane which DEGENERATES in the 7th week to form the opening of the ANUS and REPRODUCTIVE tracts
3. When the cloacal membrane appears, the wall of the yolk sac forms a VASCULARIZED out-pocketing called the ALLANTOIS that extends into the connecting stalk
 - a. In other animals, this is used for GAS EXCHANGE and WASTE REMOVAL
 - b. But in mammals, the PLACENTA does these activities
 - c. It does form some early BLOOD CELLS and blood VESSELS and is associated with the development of the URINARY BLADDER

F. Neuralation

1. The notochord also induces the ectoderm over it to form the NEURAL PLATE
2. By the end of the 3rd week, the lateral edges of the neural plate become more ELEVATED and form the NEURAL FOLDS
3. The depressed midregion is called the neural GROOVE
4. The neural folds APPROACH each other and FUSE forming a neural TUBE, starting in the MIDDLE and progressing to head and tail ends
5. As the neural tube forms, some of the ectoderm cells migrate to form several layers called neural CRESTS
6. These give rise to
 - a. Spinal and cranial NERVES and their GANGLIA
 - b. AUTONOMIC nervous system ganglia
 - c. MRINGES of the brain and spinal cord
 - d. ADRENAL medullae
 - e. Several skeletal and muscular components of the HEAD



7. Neural tube DEFECTS are caused by the ARREST of normal development and CLOSURE of the neural tube

a. SPINA BIFIDA - the vertebral column fails to close with or without spinal cord involvement

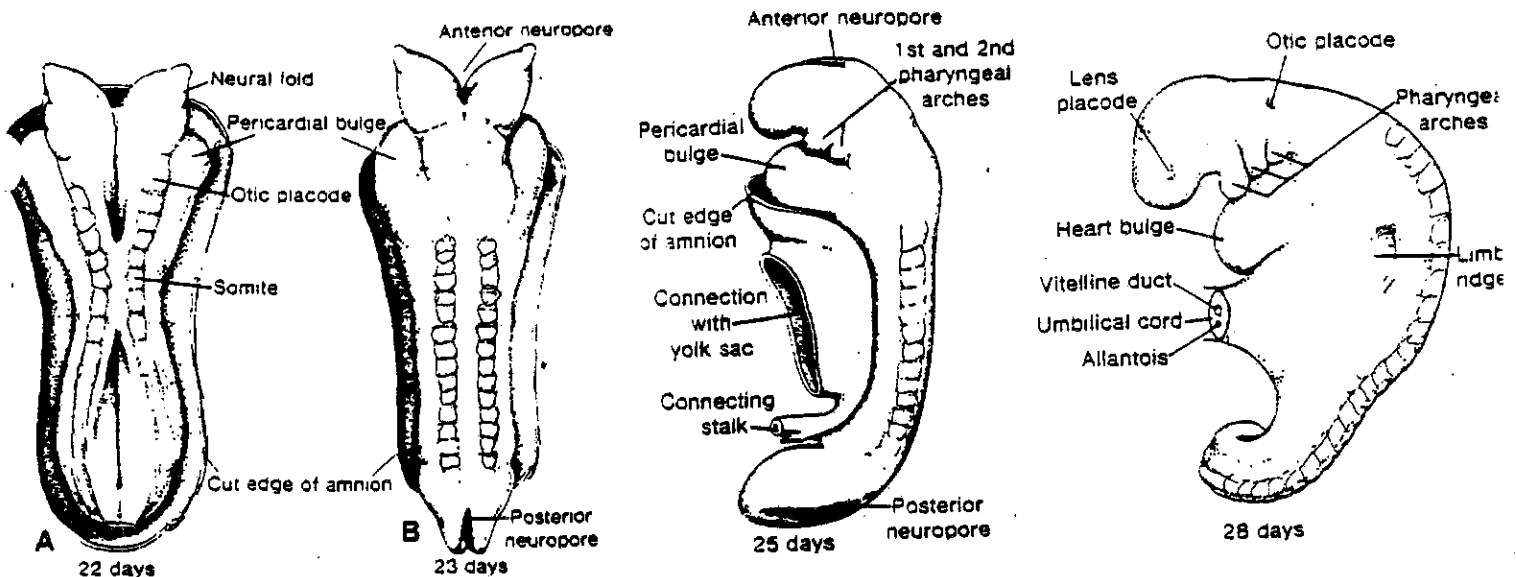
b. ANENCEPHALY 4/10,000

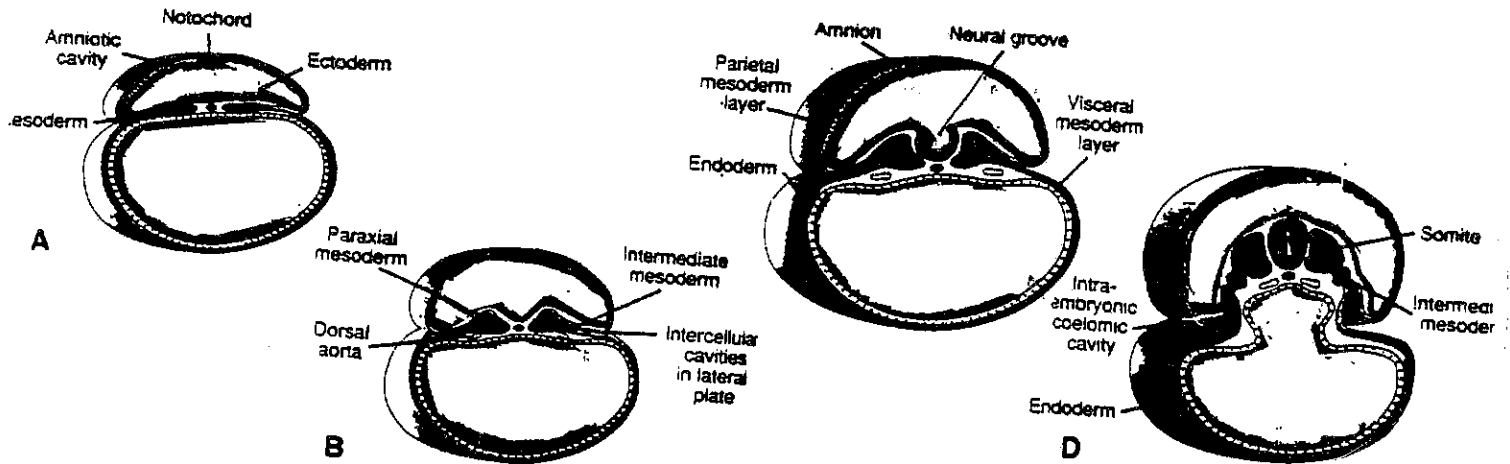
- 1) Prosencephalon (most ANTERIOR part of the neural tube and future CEREBRAL HEMISPHERES, thalamus and hypothalamus) remains in contact with the amniotic fluid and DEGENERATES
- 2) The cranial BONES fail to form
- 3) The brain stem is also ABNORMAL usually, so vital functions, like BREATHING and HEARTBEAT, may not occur
- 4) The child is STILLBORN or dies within a few DAYS, occurring in about 1/1000 with 4X times as many females as males

G. Development of Somites

1. In the 17th day, the mesoderm adjacent to the neural tube and notochord, ORGANIZES into paired, CUBE-shaped structures called somites ("LITTLE BOOIES")
2. By the end of the 5th week, 42-44 are present and correlate to the approximate AGE of the embryo
3. Each somite is composed of three regions

- a. MYOTOME - becomes skeletal muscle of neck, trunk and limbs
- b. DERMATOME - becomes connective tissue and dermis of the skin
- c. SCLEROTOME - becomes vertebrae





H. Development of the Intraembryonic Coelom

1. In the 3rd week, small SPACES appear in the lateral mesoderm that will MERGE into a large cavity
2. This SPLITS the mesoderm into two parts called SPANCHNIC and SOMATIC mesoderm
3. In the 2nd month, the intraembryonic coelom divides into PERICARDIAL (HEART), PLEURAL (LUNG) and PERITONEAL (ABDOMINAL) cavities
4. Splanchnic mesoderm forms the HEART and visceral layers of the pericardium, blood vessels, SMOOTH muscle (in walls of organs), and connective tissue of the respiratory and DIGESTIVE systems
5. Somatic become BONES and DERMIS of the limbs

I. Chorionic Villi and Placenta

1. In the 2nd week, primitive chorionic villi, PROJECTIONS of the chorion, made of cytotrophoblast cells, INVASE and become surrounded by syncytiotrophoblast of the chorion
2. Early in the 3rd week, the mesenchyme grows around it forming a loose CORE of connective tissue, SECONDARY chorionic villi, etc.
3. Blood vessels and chorionic villi CONNECT to the embryonic HEART by way of the UMBILICAL arteries and veins
4. The maternal and fetal blood vessels are in CLOSE PROXIMITY but not JOINED

5. Placentation

- a. Process of FORMING the placenta
- b. It also produces HORMONES needed to sustain the placenta
- c. At the 12th week, it has two distinct parts

- 1) FETAL - formed by the chorionic villi
- 2) MATERNAL - formed from cells of the endometrium

- d. When full grown, it is shaped like a PANCAKE

- 1) Allows OXYGEN and nutrients to DIFFUSE from the maternal to fetal blood and carbon dioxide and wastes to diffuse to the maternal blood
- 2) It acts as a protective BARRIER as most MICROBES can't get through, although viruses like AIDS, GERMAN MEASLES, CHICKEN pox, measles, ENCEPHALITIS and POLIO can
- 3) It stores nutrients like carbohydrates, proteins, CALCIUM ions and IRON that is released into the fetal circulation as required
- 4) It produces HORMONES to maintain the pregnancy
- 5) Many DRUGS, ALCOHOL and other substances that cause birth defects pass FREELY through the placenta

f. The UMBILICAL CORD connects the fetus to the placenta

- from allantois*
- 1) There are 2 umbilical arteries that take DEOXYGENATED blood and wastes to the placenta from the fetus
 - 2) There is 1 umbilical vein that brings oxygen and nutrients to the fetus
 - 3) The supporting mucous connective tissue (WHARTON'S JELLY) is derived from the ALLANTOIS and is surrounded by a layer of amnion + ATTACHED TO CERVIX OF PLACENTA

g. After the birth, the placenta DETACHES and is called "THE AFTERBIRTH"

h. The umbilical cord is TIED OFF and SEVERED with about 1" remaining that will wither and fall off 12-15 days after birth, leaving a scar where it was attached called the UMBILICUS or NAVEL

i. The placenta is a source of HORMONES, DRUGS, blood and portions can be used for BURN COVERAGE

j. VEINS can be used for blood vessel GRAFTS and cord blood can be FROZEN and provide a source of PLURIPOTENT stem cells in case the child needs them later

k. Placenta previa

- 1) The placenta may grow OVER the opening of the cervix
- 2) This may lead to SPONTANEOUS ABORTION or, in 1/250 live births, may cause PREMATURE birth and intrauterine HYPOXIA due to maternal bleeding
- 3) Sudden, PAINLESS, bright red vaginal bleeding in the 3rd trimester is the sign

III. THE FOURTH WEEK

A. All major organs appear - ORGANOGENESIS

B. All body systems have begun to develop by the 8th week although functions are MINIMAL

C. Endothelial cells of BLOOD VESSELS apparently provide some type of developmental SIGNAL necessary for organogenesis

D. During the 4th week, the embryo undergoes a dramatic change in size and shape, TRIPLING

in
size and changing from a FLAT two dimensional, two-layered disc to a 3D
CYLINDER →
in a process called embryo FOLDING